

The Master's Degree Programme
Through Evening Studies at
Sir George Williams University

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September 27, 1971

I. Introduction

When the Master's Degree in Engineering through evening studies at SGWU was first inaugurated, its stated purpose was to provide "continuing education for practising engineers in a formal setting". I have been involved with this programme for over two years, and have become increasingly alarmed over the deplorable state in which I find it. Faculty and students seem to be unaware of any comprehensive statement of policy concerning the programme. Are we trying to provide continuing education as envisaged by industry and prospective students, or are we trying for academic excellence. As I shall point out below we are in fact, a long way from doing either.

The former, shorn of all pretence, is simply a means whereby an individual who is one or more years beyond graduation at the bachelor's level, and who is working, can, in his spare time, become acquainted on a superficial level with the latest developments in engineering disciplines. On the other hand, the university is mainly directed towards the pursuit of academic excellence, and at a master's degree level, this means that the primary objective is on upgrading of the overall professional level of the student in a particular discipline. Indeed, there is little difference in purpose in education of undergraduate as opposed to master's level students. The shift in emphasis towards research does not really occur until the doctorate level.

II. Assumptions Concerning Our Programme

Holding these traditional (the word is not used in a pejorative sense) views, we have based our master's degree programme on

what seems to be the following assumptions:

- (1) The academic competence of a newly admitted evening graduate student is at a par with that of a newly minted bachelor's degree holder. There is lip service paid to the concept of make up courses, viz Engineering Analysis and Physical Systems. However, in my experience, students taking the Physical Systems course are at different points in their respective programmes, many having taken courses for which this was supposedly a prerequisite.
- (2) The student, upon receiving a master's degree, will be at the same level academically as any master's degree holder emerging from a full-time programme elsewhere.
- (3) As a result of obtaining this degree the graduate will be better qualified in the performance of his everyday work. This, I think, is our concept of continuing education as opposed to the definition given earlier.

III. The Dismal Reality

The following are observations I have made over two years of teaching, guiding and conversing with part-time master's candidates.

- (1) A significant proportion of students, although employed, (and this should be no surprise), are not currently working in jobs which could be classified as engineering. Typical job categories are maintenance, planning, supervision and administration. Further, those who are working in engineering are often doing so in very specialized

capacities, and as such make little use of their undergraduate training. The above, coupled with the fact that the student is one or more years beyond graduation, and hence is generally well on his way down the exponential decay curve of overall capability, results in an academic level which is comparable to that of a sophomore or junior undergraduate. Very often the students' grasp of elementary mathematics (algebra, analytical geometry, basic calculus) is close to negligible. I should emphasize that there are exceptions to the above state of affairs, but these are exceptions, and not the rule.

- (2) The following comments are concerned with course structure:
- (a) Some graduate courses contain exclusively sophomore and junior level material.
 - (b) Several courses fall into the category of "swing" courses, and could, or often are, taught at the advanced undergraduate level.
 - (c) There are few, if any, courses which fit the students' concept of continuing education.
 - (d) Our scheduling system results in at most 2 hours per week for 15 weeks or 30 hours of lecture and examination time for a one-term course, as compared to the 3 hrs./wk. for 13 or 14 weeks or 39 to 42 hours per term norm at most universities. It may be agreed that we require more course work than other universities; however, our courses are designed for a 40 rather than the existing 30 hour term.
 - (e) As a result of the overall lower capability of the students, teaching proceeds at a slower pace than it would otherwise. Further, students are generally unmotivated, and because there is no simple way to remedy the situation, so are instructors.

- (f) I suggest that grading standards are lowered to avoid failing students in droves. I personally always have a number of "special cases" to contend with. Other faculty members have implied to me that they have for all intents and purposes thrown grading standards out the window.
- (g) Students may withdraw from a course at any time, for any reason, up to and including the day of the final examination. I know of cases where students have attempted to withdraw after writing the final examination.
- (h) It should be noted that doctoral students also take some of these courses.

The reader may at this point be left to draw his own conclusion.

- (3) The thesis requirement is in direct contradiction to the pedagogical aims of a master's degree in engineering, and doubly so for an evening studies programme. I think that there is a general concensus among students and faculty that the thesis or dissertation serves no useful function. Further, I suspect that the general level of dissertations, again with a few exceptions, is mediocre at best.

In conclusion, our present programme is neither satisfying the needs of the students, nor proving to be academically sound. It is nothing but a very pale imitation of full time programmes offered elsewhere.

IV. A. A Proposal for Evening Division Graduate Studies

It is obvious that I do not believe that our programme can be salvaged through a few minor modifications. We should instead

start afresh and develop a rational and cohesive approach to the education of evening students who already hold a bachelor's degree. What follows is a composite of my own ideas and those of a few colleagues with whom I have had discussions on this topic.

I will begin, strangely enough, with a plea that serious consideration be given to starting a full-time master's degree programme. From an evening division point of view this would have the following advantages:

- (1) The presence of full-time students would provide some kind of norm against which to measure the performance of evening students.
- (2) The mixing of day and evening students would be beneficial in two ways. Full-time students would be exposed to individuals operating in an industrial environment, and conversely, evening students would have a better opportunity of being influenced by the academic environment of their full-time colleagues.
- (3) The presence of a full-time programme would allow us to offer to students who could obtain leave of absence from their companies, and who could possibly be subsidized by their companies to a certain extent, the possibility of obtaining a degree in 12 - 18 months. I recommend only that this be kept in mind for a future date. We are certainly not in a position to consider its implementation at this time.

Finally we could indulge our natural desire to keep promising undergraduates with us for further training.

B. Admissions Policies

Applicants for entry into the M.Eng. programme may be divided into the following categories:

- (1) A recent graduate, namely one who has graduated within a 16 months period preceeding his admission to the M.Eng. programme, who holds a B.Eng. degree or its equivalent, and whose academic record is of an acceptable standard, namely it is likely the candidate would be admitted to any Canadian University.
- (2) An applicant satisfying the requirements of (1) but who is not a recent graduate.
- (3) An applicant holding a B.Eng. degree or its equivalent, whose academic record would not normally be judged acceptable, who is not a recent graduate, but who is currently working or has spent the majority of his professional life working in fields which may be classified as engineering.
- (4) An applicant holding a B.Eng. degree, who is a recent graduate, and whose record is judged not to be acceptable.
- (5) An applicant holding a B.Eng. degree, who is not a recent graduate, who is not currently working, or who has spent the majority of his professional life in fields outside of engineering, and whose record is judged to be unacceptable.
- (6) An applicant holding a recognized B.Sc. degree or its equivalent, whose record is acceptable, namely * a high standing with a major or honours in a field allied to engineering, and who is currently working in an engineering field.
- (7) An applicant holding no degree but who has been recognized as a P.Eng. by a provincial association.

* More thought should be given to the definition of an acceptable record in this case.

(8) Other applicants.

The above categories will now be considered with reference to two classes of admission:

Class 1: admission to M.Eng. programme

Class 2: admission to qualifying programme with admission to M.Eng. programme subsequent to the passing of qualifying examinations.

Category 1: Class 1 admission

Category 2: Class 1 admission. However the candidate should be asked to write qualifying examinations in order to determine his weaknesses. He may then be asked to take qualifying courses on a noncredit basis in addition to his regular programme.

Category 3: Class 2 admission

Category 4: No admission

Category 5: No admission

Category 6: Class 2 admission

Category 7: Class 1 admission with requirement to write qualifying examinations.

Category 8: No admission

C. Course Structure

Courses available to students admitted to the graduate programme would be divided into three categories:

Category A: Qualifying Courses - These courses would be designed for graduate students holding a class 2

admission. They would give the student the opportunity to become re-aquainted, or become acquainted for the first time, with the basic concepts of engineering. These courses would not be credited towards fulfilling the requirements for a degree, but would instead be considered as extension courses.* Qualifying courses would be graded on a pass/fail basis only in order to give the student an indication of his performance. The upgrading of a student from a class 2 to a class 1 would depend solely upon his performance in qualifying examinations.

Qualifying Examinations - The passing of the qualifying examinations would grant the student full admission to the graduate programme. The examinations would differ depending on whether the student's main area of interest was in civil, mechanical or electrical (including computer science) engineering. They would consist of, say, two three-hour examinations which would test the student's comprehension of the fundamentals of mathematics and the various engineering disciplines. The level could be such that undergraduate students who have completed their core programmes would be expected to pass them. The examinations could be offered

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I note in passing that such courses could serve another useful function. There are at present no facilities in the Montreal area for an individual to follow courses which would prepare him to write CEQ examinations. I gather that such facilities are badly needed and Sir George is the logical institution to provide them.

two or three times a year, and would be the responsibility of the EGSC who would act through the Secretary for Graduate Studies. Students could write these examinations whenever they felt prepared to do so; with a maximum of two or three attempts being permitted. This, in my opinion, is the only way we can control the quality of graduate students entering the master's programme.

Category B: Swing Courses - These courses would be available to both senior undergraduates as elective courses, and to graduate students having a class 1 admission, providing that the programme allowed no more than say, $\frac{1}{2}$ of the total course requirement to come from the "swing" group. The main advantage of swing courses is that they would, as mentioned earlier, eliminate unnecessary duplication. Further, these would again be the opportunity for graduate students who are working to mix with full-time senior undergraduates, the majority of whom will soon be joining their ranks.

Also I think that the "swing" area would be a good place to introduce a few courses which would fit the industrial concept of continuing education. Taking my own area of networks as an example, why would it not be possible to have a course which would in essence be "Design your own Filter". Prerequisites for such a course would be a knowledge of network analysis at an undergraduate level, and a traditional course outlining the principles of network synthesis. The content of the course would consist of a description of approximation

techniques for expressing desired specifications in terms of functions which can be physically realized as filters, a compendium of the best filter designs available (passive, active, crystal, etc.), with students called upon to use these designs in practical situations. The level of the course could in this case be judged from a perusal of the following publications:

1. Moschytz, G.S., "The Operational Amplifier in Linear Active Networks", IEEE Spectrum, vol. 7, pp. 42-50, Jan. 1970.
2. Washington, H.G., "Four Ways to get Active with Filters", The Electronic Engineer, pp. 50-55, January 1970.
3. Mitra, S.K., "Synthesizing Active Filters", IEEE Spectrum, vol. 6, pp. 64-68, December 1969.

It would be impossible to cover in depth the material contained in such a course within a 30 hour period of lecture time, and as such I am recommending that we sacrifice depth for breadth. I suspect that these courses would be attended by very large numbers of students (40-50) since they would also be available to senior undergraduates and are of a different nature than the normal course offered at a university. Some control would have to be exercised over the number of such courses made available, as well as the number any student, graduate or undergraduate, would be permitted to take.

Category C: Graduate Courses - These courses would be available only to graduate students holding a class I admission.

These courses, because of the 30 hour period of lecture time, should differ from graduate courses offered elsewhere. Material in a given area, which at other universities is given in a single full year course, or in a sequence of two one-term courses should be rearranged into three courses at Sir George. Alternatively, the means should be found for increasing lecture time from two to three hours per week.

Grading - At present, the (U, S, H,) set of grades presents severe problems for most instructors. Often a student, whom a professor does not want to fail outright, but with whom he is not entirely satisfied, will receive an S grade for lack of anything better. Probably the simplest solution would be to adopt an (A,B,C,F) set of grades along with a grade point average scheme for control of overall performance.

Technical Report - Instead of the thesis, dissertation, or major technical report, we could ask a student to prepare a report on a topic assigned by his faculty advisor, this topic, where possible, being related to the student's current employment. The report would have a credit equivalent to a single one-term course. The major objective of the technical report would be to provide the student with an exercise in technical writing at a fairly advanced level. The report would be graded A,B,C, or F, and would be treated along the same lines as the undergraduate technical report.

D. Programme Structure

Defining the one-term 30 hour course as having one credit, our requirement of 14 credits for graduation seems realistic. This would permit the majority of students entering with a class 1 admission to complete the programme in 2 - 2½ years. Those with a class 2 admission would likely require about 3 - 3½ years to complete their programme.

It would probably be a good idea to require the student to "Major" in a given area. This would necessitate grouping courses into various options, and then requiring the student to select a given option, that is, he would have to select, say, half his courses from within a given option. Once his "core" programme was settled, he could then choose his other courses at will. Withdrawals from courses would be permitted no later than, say, 3 weeks prior to the final examination, or the last lecture period if no exam is given. Requests for withdrawals beyond this time would have to be considered by the EGSC.

E. Graduation Requirements

Graduation would depend upon the completion of 14 credits, and the obtaining of a satisfactory grade point average (GPA), say 3.0. The GPA would be calculated by the method already approved by faculty council for undergraduate students, with possibly more weight given to graduate than swing courses. All credit courses taken by the student, except for those from which he has withdrawn will be considered when calculating the GPA.

V. Conclusion

While I do not pretend that this document constitutes the ultimate solution to our problems, I do hope that it will crystallize our growing concern over the inadequacy of the Master's Programme, and second, that it will prompt within the faculty at large, and the EGSC in particular, the deliberations necessary to put it on a sound footing in the shortest possible time.